Neural Network Sunmary

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1 Introduction

activation function : Sigmoid Function,Relu
optimizer:Adam,Sigmoidprime
Loss function:$\frac{[y_{pred}-feedforward(x)]^2}{2}$

2 Sigmoid Function

An activation function.It is a key part of Nerual Network and it can be differentiable.It can make the Nenual Network unliner.

3 SigmoidPrime Function

It is an differential Sigmoid Funtion. It can reduce error of gradient so it is some kind of loss function and Let's take a look the proof of SigmoidPrime

$$\sigma(x) = \frac{1}{1+e^{-x}}$$

$$\sigma^{'}(x) = \frac{d}{dx}\sigma(x) = \frac{d}{dx}\frac{1}{1+e^{-x}} = \frac{d}{dx}(1+e^{-x})^{-1}$$

$$-------------skip-------------$$

Tip: find $f^{'}(x)$ if $f(x)=\frac{A}{B+Ce^x}$
Answer:

$$\frac{d}{dx}[\frac{1}{g(x)}]=\frac{1^{'}g(x)-1g^{'}(x)}{g(x)^2}=\frac{g^{'}(x)}{[g(x)]^2}$$

if $g(x)$=constant

$$\frac{d}{dx}[\frac{g(x)}{h(x)}]=\frac{g^{'}(x)h(x)-g(x)h^{'}(x)}{h(x)^2}=\frac{-kh^{'}(x)}{[h(x)]^2}$$

$$f^{'}(x)=\frac{-A[\frac{d}{dx}(B+Ce^x)]}{(B+Ce^x)^2}=\frac{-A(0+Ce^x)}{(B+Ce^x)^2}=\frac{-ACe^x}{(B+Ce^x)^2}$$

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Hence:

$$=-(1+e^{-x})^{-2}\frac{d}{dx}(1+e^{-x})=-(1+e^{-x})^{-2}[\frac{d}{dx}(1)+\frac{d}{dx}(e^{-x})]$$

$$=-(1+e^{-x})^{-2}[0+\frac{d}{dx}(e^{-x})]=-(1+e^{-x})^{-2}[\frac{d}{dx}(e^{-x})]=-(1+e^{-x})^{-2}[e^{-x}\frac{d}{dx}(-x)]$$

$$-(1+e^{-x})^{-2}[e^{-x}(-1)]=-(1+e^{-x})^{-2}(-e^{-x})=\frac{e^{-x}}{(1+e^{-x})^2}=\frac{1(e^{-x})}{(1+e^{-x})(1+e^{-x})}$$

$$=\frac{1}{1+e^{-x}}\frac{e^{-x}}{1+e^{-x}}=\frac{1}{1+e^{-x}}\frac{e^{-x}+1-1}{1+e^{-x}}=\frac{1}{1+e^{-x}}(\frac{1+e^{-x}}{1+e^{-x}}-\frac{1}{1+e^{-x}})$$

$$=\sigma(x)[1-\sigma(x)]$$

4 Relu Function

5 Adam Function

6 Loss Function